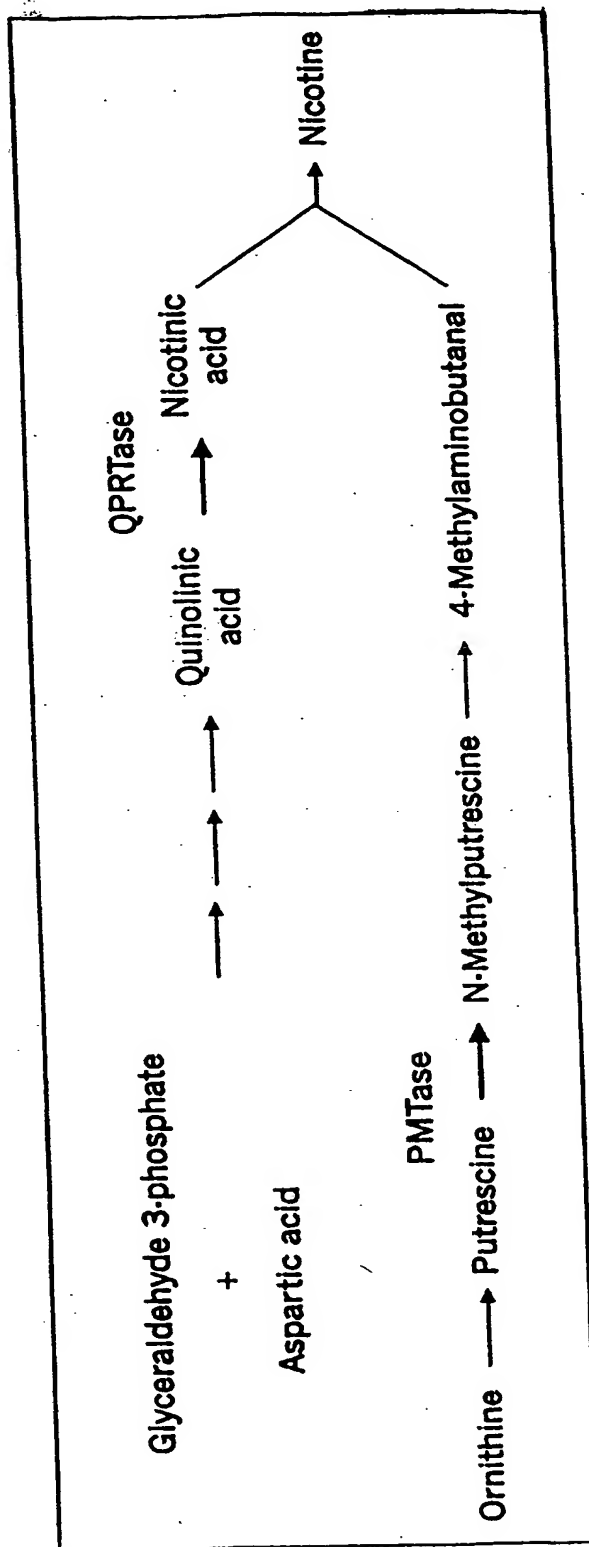


FIG. 1



MODIFYING NICOTINE AND NITROSAMINE LEVELS IN TOBACCO

Mark A. Conkling

Appl. No.: Unknown Atty Docket: VTOB.033C1

```
caaaaactat tttccacaaa attcatttca caaccccccc aaaaaaaaac cATGTTTAGA 60
GCTATTCCTT TCACTGCTAC AGTGCATCCT TATGCAATTA CAGCTCCAAG GTTGGTGGTG 120
AAAATGTCAG CAATAGCCAC CAAGAATACA AGAGTGGAGT CATTAGAGGT GAAACCACCA 180
GCACACCCAA CTTATGATTT AAAGGAAGTT ATGAAACTTG CACTCTCTGA AGATGCTGGG 240
TTTCTAGCAA AGGAAGACGG GATCATAGCA GGAATTGCAC TTGCTGAGAT GATATTCGCG 360
GAAGTTGATC CTTCAATAAA GGTGGAGTGG TATGTAAATG ATGGCGATAA AGTTCATAAA 420
GGCTTGAAAT TTGGCAAAGT ACAAGGAAAC GCTTACAACA TTGTTATAGC TGAGAGGGTT 480
GTTCTCAATT TTATGCAAAG AATGAGTGGG ATAGCTACAC TAACTAAGGA AATGGCAGAT 540
GCTGCACACC CTGCTTACAT CTTGGAGACT AGGAAAACTG CTCCTGGATT ACGTTTGGTG 600
GATAAATGGG CGGTATTGAT CGGTGGGGGG AAGAATCACA GAATGGGCTT ATTTGATATG 660
GTAATGATAA AAGACAATCA CATATCTGCT GCTGGAGGTG TCGGCAAAGC TCTAAAATCT 720
GTGGATCAGT ATTTGGAGCA AAATAAACTT CAAATAGGGG TTGAGGTTGA AACCAGGACA 780
ATTGAAGAAG TACGTGAGGT TCTAGACTAT GCATCTCAAA CAAAGACTTC GTTGACTAGG 840
ATAATGCTGG ACAATATGGT TGTTCATTA TCTAACGGAG ATATTGATGT ATCCATGCTT 900
AAGGAGGCTG TAGAATTGAT CAATGGGAGG TTTGATACGG AGGCTTCAGG AAATGTTACC 960
CTTGAAACAG TACACAAGAT TGGACAACT GGTGTTACCT ACATTCTAG TGGTGCCCTG 1020
ACGCATTCCG TGAAAGCACT TGACATTTCC CTGAAGATCG ATACAGAGCT CGCCCTTGAA 1080
GTTGGAAGGC GTACAAAACG AGCATGAgcg ccattacttc tgctataggg ttggagttaa 1140
agcagctgaa tagctgaaag gtgcaaataa gaatcatttt actagtgtgc aaacaaaaga 1200
tccttactg tgtaatcaaa caaaaagatg taaattgctg gaatatctca gatggctctt 1260
ttccaacctt attgcttgag ttggtaatat cattatagct ttgttttcat gtttcatgga 1320
atgtgttaca atgaaaaaac ttgatttata agtttggtgt atgtaaaatt ctgtgttact 1380
tcaaataatt tgagatgtt 1399
```

SEQ ID NO:1 (SEQ ID NO:3 all caps)
FIGURE 2A

```
MFRAIPFTAT VHPYAITAPR LVVKMSAIAT KNTRVESLEV KPPAHPTYDL 50
KEVMKLALSE DAGNLGDVTC KATIPLDMS DAHFLAKEDG IIAGIALAEM 100
IFAEVDPSLK VEWYVNDGDK VHKGLKFGKV QGNAYNIVIA ERVVLNFMQR 150
MSGIATLTKE MADAHPAYI LETRKTAPGL RLVDKWAVLI GGGKNHRMGL 200
FDMVMIKDNH ISAAGGVGKA LKSVDQYLEQ NKLQIGVEVE TRTIEEVREV 250
LDYASQTKTS LTRIMLDNMV VPLSNGDIDV SMLKEAVELI NGRFDTEASG 300
NVTLETVHKI GQTGVTYISS GALTHSVKAL DISLKIDTEL ALEVGRRTKR 350
A 351
```

SEQ ID NO:2
FIGURE 2B

MODIFYING NICOTINE AND NITROSAMINE LEVELS IN TOBACCO

Mark A. Conkling

Appl. No.: Unknown

Atty Docket: VTOB.033C1

N. tabacum	MFRAIPFTATVHPYAITAPRLVVKMSAIATKNTRVESLEVKPPAHPTYDL	SEQ ID NO: 4
R. rubrum	*-----RPNH-----PVAALS*F---AI	SEQ ID NO: 5
M. leprae	*-----LSDC-----EFDAAR-----	SEQ ID NO: 6
S. typhimurium	*-----PPRR*NPDDR*-----DALL*RINLDI*A---AV	SEQ ID NO: 7
E. coli	*-----PPRR*NPDTR*-----DELL*RINLDI*G---AV	SEQ ID NO: 8
H. sapien	*-----D*EG*ALLPPVTLAALVDSWLREDC*G-----	SEQ ID NO: 9
S. cerevisiae	*-----PVYE-HLLPVNGAWRQDVTNWLSEDV*S-----	SEQ ID NO: 10
N. tabacum	KEVMKLALSEDAGNLGDVTCKATIPLDMESDAHFLAKEDGIIAGIA----	SEQ ID NO: 11
R. rubrum	D*AVRR***A**L*RA**I*ST*****AATRAH*RFV*RQP**L**LGCA--	SEQ ID NO: 12
M. leprae	-DTIRR***H**LRYGL*I*TQ**V*AGTVVTGSMVPR*P*VIAGVDVALL	SEQ ID NO: 13
S. typhimurium	AQALREDLGGEVDAGN*I*AQL-L*A*TOAH*TVITR*D*VF---CGKR	SEQ ID NO: 14
E. coli	AQALREDLGGTVDANN*I*A*L-L*ENSR*H*TVITR*N*VF---CGKR	SEQ ID NO: 15
H. sapien	-----LNYAALVSGAGP*QAALWAKSP*VL---AGQP	SEQ ID NO: 16
S. cerevisiae	-----FDFGGYVWGSDLKEANLYCKQD*ML---CGVP	SEQ ID NO: 17
N. tabacum	-LAEMIFAEVDPSLKVEWYVNDGDKVHKGLK-----FGKVQGNAYNIVI	SEQ ID NO: 18
R. rubrum	--RSAF-ALLDDTVTFTTPLE**AEIAA*QT-----VAE*A*A*RT*LA	SEQ ID NO: 19
M. leprae	VLD*VF-GVDGYRVLY--R*E**ARLQS*QP-----LLTVQAA*RGLLT	SEQ ID NO: 20
S. typhimurium	WVE*VFIQLAGDDVRLT*H*D***AI*ANQT-----VFELN*PARVLLT	SEQ ID NO: 21
E. coli	WVE*VFIQLAGDDVTII*H*D***VINANQS-----LFELE*PSRVLLT	SEQ ID NO: 22
H. sapien	FFDAIFTQL---NCQVS*FLPE*S*LVPVAR-----VAEVR*P*HDLLE	SEQ ID NO: 23
S. cerevisiae	FAW*VFNQC---ELQVE*LFKE*SFLEPSKNDSGKIVVAKIT*P*K**LL	SEQ ID NO: 24
N. tabacum	AERVVLNFMQRMGSIATLTKEAD--AAH--PAYILETRKTAPGLRLVDK	SEQ ID NO: 25
R. rubrum	***TA***LGH*****R*RRFG*AI*HT--R*RLTC***T***GLE*	SEQ ID NO: 26
M. leprae	***TM***VCHM***V*VAWV*AVRGT--K*KIRD***L***ALQ*	SEQ ID NO: 27
S. typhimurium	G**TA***V*TL**VASEVRRYVGLL*GT--QTQL*D***L***TAL*	SEQ ID NO: 28
E. coli	G*PTA***V*TL**VASKVRHYVELLEGT--NTQL*D***L***SAL*	SEQ ID NO: 29
H. sapien	G***A***TLARC*****SAAAAVEAARGAGWTGHVAG*****T*F***E*	SEQ ID NO: 30
S. cerevisiae	***TA**ILSR*****TASHKIISLARSTGYKGTIAG*****T***RLE*	SEQ ID NO: 31
N. tabacum	WAVLIGGGKNHRMGLFDMVMIKDNHISAAGGVGKALKSVDOYLEQNKLQI	SEQ ID NO: 32
R. rubrum	Y**RC***S***F***D*A*L*****AVA***SA**SRAR-AGVGIMVRI	SEQ ID NO: 33
M. leprae	Y**RV***V***L**G*TAL*****VA*V*S*VD**RA*R-AAAPEL-PC	SEQ ID NO: 34
S. typhimurium	Y***C***A***L**T*AFL*****I*S*S*RQ*VEKAF-W*HPD-APV	SEQ ID NO: 35
E. coli	Y***C***A***L**S*AFL*****I*S*S*RQ*VEKAS-W*HPD-APV	SEQ ID NO: 36
H. sapien	YGL*V**AAS**YD*GGLVML*D**VPP***EK*VRAARQ---AADFAL	SEQ ID NO: 37
S. cerevisiae	YSM*V**CDT**YD*SS**ML*D***W*T*SITN*V*NARA---VCGFAV	SEQ ID NO: 38

FIGURE 3

MODIFYING NICOTINE AND NITROSAMINE LEVELS IN TOBACCO
Mark A. Conkling
Appl. No.: Unknown Atty Docket: VTOB.033C1

N. tabacum	GVEVETRTIEEVREVL DYASQTKTSLTRIMLDNMVVPLSNGDIDVSMKE	SEQ ID NO: 39		
R. rubrum	EI****-L*QLA***AVGGAEV-----VL****-----DAPT----*TR	SEQ ID NO: 40		
M. leprae	E****S--L*QLDAM*A-EEPEL-----*L***F--*VWQTQV----AVQ	SEQ ID NO: 41		
S. typhimurium	E****N--LDELDDA*K-*GADI-----*****F-----NTDQ---MR*	SEQ ID NO: 42		
E. coli	E****N--L**LD*A*K-*GADI-----*****F-----ETEQ---MR*	SEQ ID NO: 43		
H. sapien	K****CSSLQ**VQAAE-*GADL-----VL***F-----KPEELHPTAT	SEQ ID NO: 44		
S. cerevisiae	KI***CLSED*AT*AIE-*GADV-----*****F-----KGDGLK*CAQ	SEQ ID NO: 45		
N. tabacum	AVELI---NGRFDTEASGNVTLET VHKIG-QTGVTYISSGALTHSVKALD	SEQ ID NO: 46		
R. rubrum	**DMV---A**LV*****G*S*D*IAALA-ES**D***V*****TT**	SEQ ID NO: 47		
M. leprae	RRDIR---APT VLL*S**GLS**NAAIYA-G***DYLA V*****RI**	SEQ ID NO: 48		
S. typhimurium	**KRV---**QARL*V*****AE*LREFA-E***DF**VG*****R***	SEQ ID NO: 49		
E. coli	**KRT---**KALL*V*****DK*LREFA-E***DF**V*****Q***	SEQ ID NO: 50		
H. sapien	*LKAQFPSVA---VEA**GIT*DNLPQF-CGPHIDV**M**QA*P***	SEQ ID NO: 51		
S. cerevisiae	SLKNKWNGKKHFLLEC**GLN*DNLEEYLCD-DIDYI*TSSIHQGTPVI*	SEQ ID NO: 52		
N. tabacum	ISKLIIDTELAEVGRRTKRA	<u>% Identity</u>	<u>% Similarity</u>	SEQ ID NO: 53
R. rubrum	*G*D*VVA-----PPKAERA	15.9	43.2	SEQ ID NO: 54
M. leprae	*G*DL	18.3	37.3	
S. typhimurium	LSMRFC	18.2	34.8	SEQ ID NO: 55
E. coli	LSMRFR	17.9	32.8	SEQ ID NO: 56
H. sapien	F***L---F*K*VAPVP*IH	16.8	31.7	SEQ ID NO: 57
S. cerevisiae	F***LAH	14.6	27.8	SEQ ID NO: 58

FIGURE 3 continued

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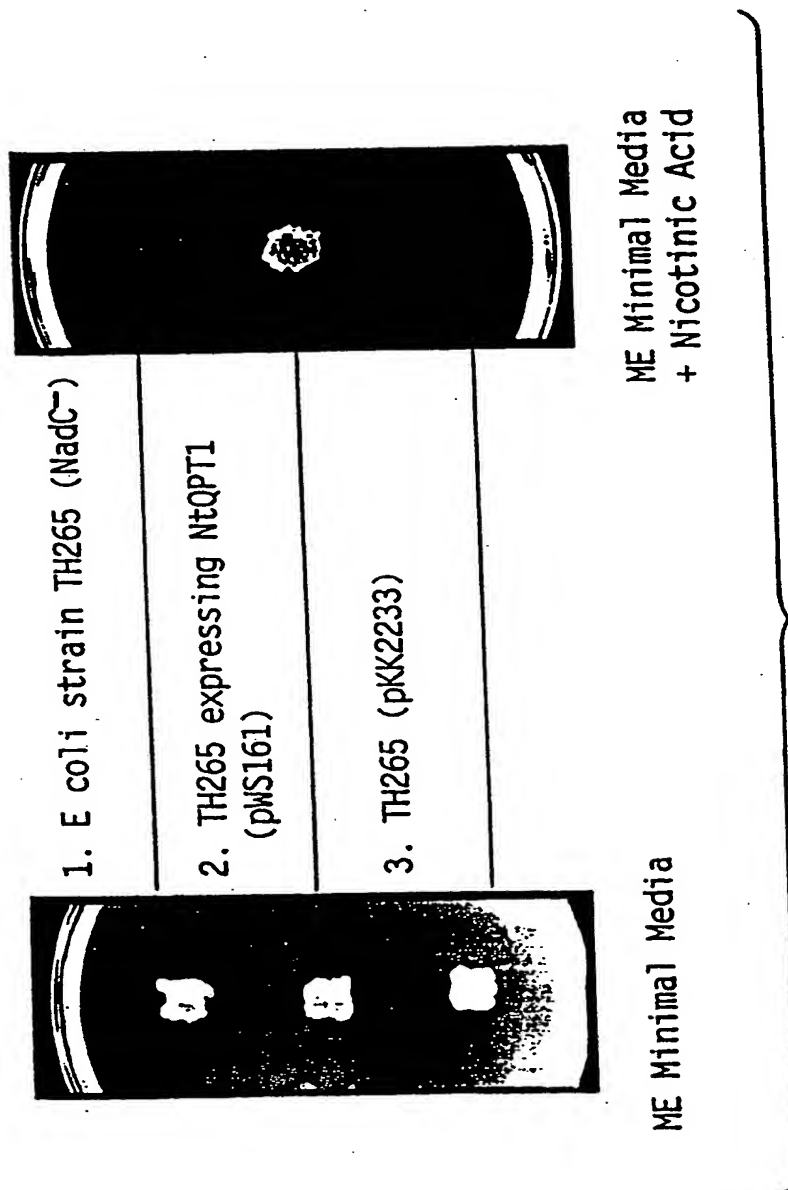


FIG.4

FIG. 5

